



**US Army Corps
of Engineers®**

Engineer Research and
Development Center

Service

Interdisciplinary Imagery Analysis

Description

The Topographic Engineering Center (TEC) has a team of experts who can perform interdisciplinary imagery analyses in house, and the facilities to train outside (Federal) agencies that need to perform the work themselves. This interdisciplinary approach to imagery analysis provides government planners

a quick, economical way to gather and interpret information that reflects the environmental consequences of construction projects. Air photo studies can help trace historical change, identify current conditions, and predict the impact of proposed developments. Stereoscopic aerial photography portrays the distribution of the physical, biological, and cultural components of a given landscape (e.g., the background image shown above). Each environmental component has its own set of identifying features. Analysts can examine these in detail to identify landforms, soils, vegetation, drainage, land use, road networks and other factors (see the image overlays to the right).



Background Image



Drainage Overlay



Rock Types Overlay



Transportation Overlay



Vegetation Overlay

Capabilities

Experts from fields such as geology, biology, botany, forestry, geography, engineering, hydrology, pedology, economics, architecture, archeology, and law can study air photos to extract environmental information. They can determine the physical, biological, cultural, and engineering characteristics in a given area; evaluate how they interact; and predict how they will respond to environmental changes induced by humankind or nature. Team members can examine archival photography to trace the dynamics of environmental change over a 55- to 70-year period, evaluate resource utilization from past to present, and assess whether existing resources can meet future needs. The information from such analyses can potentially be incorporated into a geographic information system (GIS) database to support future work. Conducting an interdisciplinary air photo study involves assembling an appropriate team of experts and obtaining photo coverage for the area and time periods under investigation. The disciplines represented on the team will vary depending on the problem being studied and the information needed to solve it. TEC has teams of experts in relevant disciplines, and ready access to contractors should the need arise for extra capability.

The analysis process begins with the preparation of a stereoscopic photomosaic of the study area. The photomosaic consists of alternate prints assembled in mosaic form and stapled to celotex or other lightweight illustration board. Photographic prints of the mosaic be used in the photo analysis and presentation of findings. After scanning the prints, information from such an analysis can potentially be incorporated into a GIS database.

The team members study the photomosaic and familiarize themselves with the landscape patterns depicted. They then systematically examine the imagery to identify and describe specific terrain factors. They record this information on transparent overlays, which show the boundaries and distribution of drainage networks, landforms, soils and rocks, vegetation, and land use. The team may also prepare overlays for such features as landslides, archeological sites, geologic lineaments, and faults. Together with descriptive information developed during the study, the overlays form an environmental database for the area under investigation. The team then correlates its findings with on-site field check. The time and effort needed for field verification will depend on the complexity of the area and predicted environmental sensitivities.

Team members can use the information gathered to assess the impact of planned actions, pinpoint problem areas, and work out solutions. They can compare data from different periods, document environmental changes and establish cause-and-effect connections between the past and the present. A four- to five-person team can examine photos and prepare a collection of factor maps for a 400 sq mi area in about 3 days.

Supporting Technology

Aerial photos can easily be obtained for almost any location in the United States. Archival coverage that documents many parts of the country for the past (nearly) 70 years is available. The National Agricultural Library, Salt Lake City, UT, and the National Archives, College Park, MD, both maintain extensive collections of aerial photos. Potential photo sources include other Federal and state agencies, such as the U.S. Geological Survey, U.S. Forest Service, U.S. Fish and Wildlife Service, NASA, and state natural resource, utilities, and transportation departments. Private photo mapping companies can provide up-to-date photos or photos taken to meet set specifications.

Conducting an air photo study does not demand the use of complex equipment. Pocket stereoscopes, hand lenses, small magnifiers, stable base inking film, permanent marking pens, and some basic graphic supplies are about all a team needs to get started. Groups with special documentation requirements may need the services of cartographic draftsmen, photographers, computer operators, GIS technicians, and other production specialists.

Benefits

Planners benefit from the team's ability to quickly gather and analyze the information to assess the impact of planned actions, pinpoint problem areas, and work out solutions *before* the project begins. Since each participant has a different area of expertise, the team can develop a great deal of information in a short time. They can compare data from different periods, document environmental changes, and establish cause-and-effect connections between the past and the present.

Success Stories

Interdisciplinary imagery analysis has been used to select sites for highways, railroads, and airfields; assess the impact of increased waterway discharge; study dredged material disposal; identify WWI chemical weapons testing and burial sites; and analyze soil erosion. Other applications have involved: tracing acid drainage from mines, monitoring fish and wildlife attrition, determining the environmental impact of dams, performing historical site analysis for environmental restoration of bombing target areas, preparing information for use in law suits, and supporting military engineering projects.

ERDC POC

John Jens, CEERD-TO-T; tel: 703-428-6948; DSN: 364-6948; e-mail:

John.C.Jens.Sr@erdc.usace.army.mil